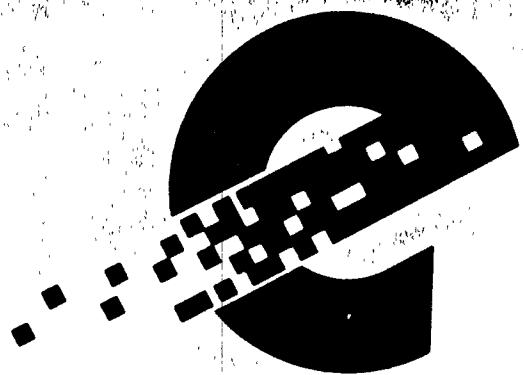


REPORT



Environmental Consultant Company

PREPARED FOR:

**INTERMOUNTAIN POWER COMPANY
MARCH 16, 1990
TLN 7774**

SECTION I REPORT TEXT
PHOTOGRAPHS

SECTION II DATA SHEETS

SECTION III PARTICLE SIZE
TOP

SECTION IV PARTICLE SIZE
MIDDLE

Environmental Consultant Company
dedicated to filtration science...

P.O. Box 42537 • Phoenix, AZ 85080 • 602-582-5155
Laboratory: 2401 W. Behrend Dr., Suite 1 • Phoenix, AZ 85027

March 16, 1990
TLN 7774
Section I
Page 1

R E P O R T

INTERMOUNTAIN POWER SERVICE CORPORATION

REFERENCE: DELTA, UTAH - UNITS 1 AND 2

Fourteen (14) filter bags were submitted for testing and evaluation.

Thirteen bag specimens were used and sampled from Units 1 and 2. One bag was a new filter bag and was utilized as the control data values in physical properties.

It is reported that Unit 2 is operating at a higher pressure differential across the system compared to Unit 1 baghouse.

Both systems are G.E.E.S.I. reverse air type baghouses collecting fly ash particulate off coal fired boiler operations.

The bags were labeled as follows:

<u>UNIT</u>	<u>COMPARTMENT</u>	<u>BAG</u>
✓2	A-5	P-2
✓2	A-15	D-22
✓2	B-4	J-21
✓2	B-13	C-3
✓2	B-13	D-3
✓2	C-1	J-1
✓2	C-16	P-20
✓1	A-6	O-2
✓1	B-8	N-21
✓1	B-4	J-21
✓1	B-14	D-3
✓1	C-1	J-1
✓1	C-16	O-20
+1 NEW FILTER BAG		

Should have sent

Unit 1 1A11 D16

Instead of
Unit 2 2B13 D3

look at
difference
in
strength

March 16, 1990
TLN 7774
Section I
Page 2

Attached are the results of the testing data.

UNIT 2:

In general, all seven used filter bags exhibited a distinct as received air flow capacity acceptance level. Of significance is the upper/top bag area from the cap down past the second anti-collapse ring where low flow capacities are evident and well below the acceptance levels demonstrated in the corresponding center and bottom areas of the bags.

Microscopic examination of the retained filter cake on the bag specimens revealed some degree of dust particulate agglomerations within the filter cake structure. Photo's A and B are typical microscopic views of the as received retained filter cake revealing the nodulas contained within the loose residual dust particulate. The overall cake is generally porous in structure with the nodula representing a low population level.

This characteristic was exhibited on all seven bags and in full profile down the bag lengths.

Under reverse flows, the residual dust demonstrated good release properties with high loose dust particulate discharge. It was noted that the enlarged particulate nodulas were retained as shown by Photo's C and D again typical to all bags.

The nodulas are not releasing due to fiber encapsulation (Photo E) of protruding fiberglass filaments holding the nodula under cleaning forces. The fiber encapsulation is indicative of the nodula formations having occurred directly on the collection surface. These retained nodulas are non-flow zones with flow acceptances diverted through the voids between the agglomerations and accounts for one factor of the overall low flow acceptance capacities.

Soxhlet extractions of the nodulas for soluble fractional analysis revealed 4.73 percent by weight of metallic sulphate salts predominately calcium sulphate. These hygroscopic salts form through the chemical reaction between the fly ash metallic oxides (calcium oxide) and sulfur oxide gas (sulfur trioxide). In the presence of high moisture, the hygroscopic salts will generate sufficient bonding forces to generate the agglomerate

March 16, 1990
TLN 7774
Section I
Page 3

growth.

The generation of these agglomerate are common to fly ash collection and cannot be usually avoided. It is the excess of nodulas through major moisture encounters (tube leaks, economizer leaks, dew points, etc.) that generate serious high pressures/low throughput situations.

These seven bags demonstrate a nominal level of agglomerations however is generating the higher restrictions being experienced.

Specific to the bag top zones where low/below bag average flows were detected, very high levels of fine micron particulate were apparent in these areas.

Samples of dust were removed from the top collection surface and the middle collection surface for evaluation. The most critical analysis is in the actual count testing as just one particle of 50 micron size contains the same weight/volume as one million particles at 0.5 micron size.

The following is a summary of the comparative data:

<u>2-B4-J21</u>	<u>MEDIAN COUNT SIZE</u>	<u>% BELOW 1 MICRON</u>
TOP SECTION	0.724	67.97
MIDDLE SECTION	0.985	50.54%

It would appear that Unit 2 inlet contains fine micron size however, the most common cause of fine particles in the top zones are as follows:

- [A] The isolation poppet valves are not fully seated allowing slight flow to continue up through the bags during the dwell phase preventing the fines from settling out of the bag area. When back on line, the fines re-entrain/accumulate in the top area.
- [B] The dwell period is not of sufficient duration to allow released fine dust to settle out.

It is projected that the moisture induced dust

March 16, 1990
TLN 7774
Section I
Page 4

agglomerations and the fine particle accumulation in the top bag area are the contributing factors to the average low capacity ratings. All seven submitted bags exhibited this situation to some degree.

The physical strengths and flex properties of Unit 2 specimen are at good retention levels. There is no evidence of any chemical or thermal deterioration. All current losses in physical properties are attributed to normal adjustments in values from environmental exposures and nominal service use.

The bags demonstrate a general termination factor of 25 percent.

All bags revealed good collapse patterns under reverse flows. Photo F is a view of the typical lines of collapse created under reverse air with good intensity and spacing. This is indicative of good upward spring tensioning on the bags.

UNIT 1:

These six filter bags all demonstrated higher flow capacity acceptances in profile. The substantially lower levels of flows in the top zone were not experienced with Unit 1 bags. There is a slight decline in the top acceptances due to fine particle accumulation however to a very minor extent with no pronounced level of fines as demonstrated by Unit 1 bags.

The filter cake as received was of a more porous structure with low nodula population levels. Release characteristics were good under reverse flow as shown in microscopic Photo G (typical to these six bag specimens).

Noted is a generally lower level of retained agglomerates after reverse air in comparison of Unit 2 specimens.

The level of metallic sulphates under soxhlet extractions on Unit 1 revealed 2.79% substantially less than Unit 2 bag samples.

Again, hygroscopic metallic sulphates are unavoidable in coal combustion. This level is considered normal.

These bags also generally contain fine particulate

March 16, 1990
TLN 7774
Section I
Page 5

population accumulations in the upper zones however to a reduced extent compared to Unit 2 bags.

The physical strengths and flex endurances are also rated at good retention levels with current fatigue resulting from service use. There is no chemical or thermal deterioration on the bags.

These bags are rated at 35% to 40% termination levels.

CONCLUSIONS:

- Unit 1 flow capacity levels are generally at nominal acceptance levels.
- The bags are at good tensioning levels.
- Current rate of fatigue is at 40% maximum termination resulting from service use.
- Unit 1 flow capacity levels due to the top bag fine dust accumulation and dust agglomerations are at low average acceptance levels.

*Should
this be?
2*

It is suggested that after reverse air cleaning, that compartment remain in a prolonged dwell phase of 20 minutes prior to returning to service and normal reverse air cycles. This procedure may relieve the fine dust restrictions. If relief is gained, a periodic duplication of this procedure can be repeated compartment by compartment.

- Unit 2 bags also demonstrated good tensioning and collapse patterns.
- The termination factor of these bags is rated at 25 percent based on current fatigue levels of these bags.

7774
TLN

dedicated to filtration science...

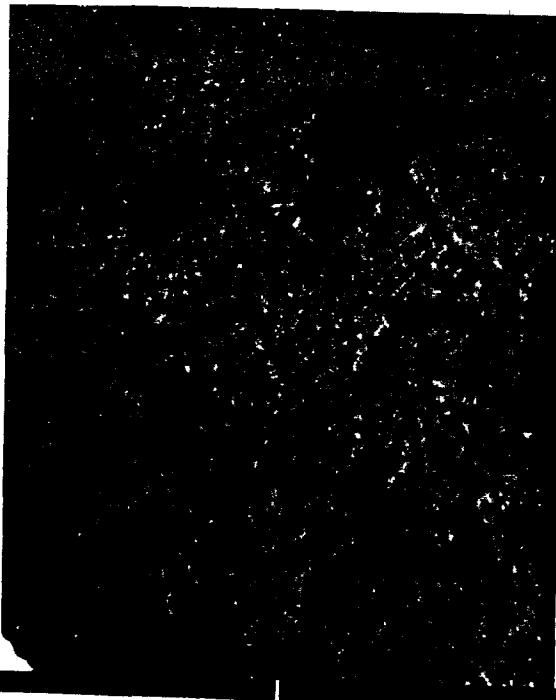


PHOTO A - NODULA POPULATION

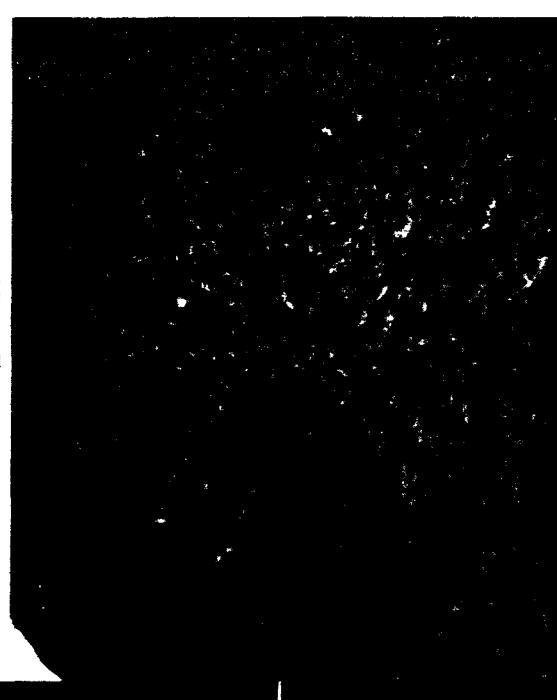


PHOTO B - NODULA POPULATION

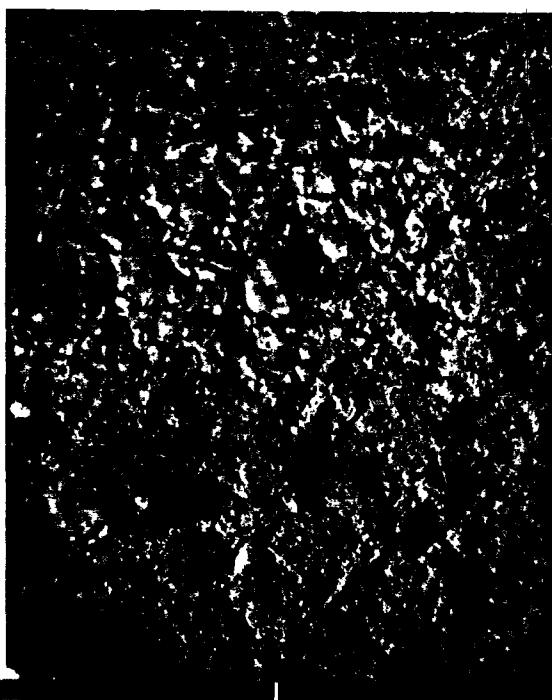


PHOTO C - RETAINED NODULA

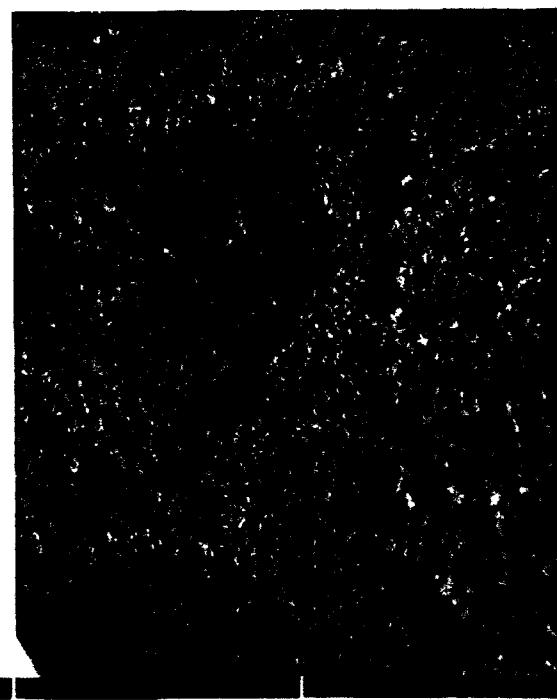


PHOTO D - RETAINED NODULA

IP12_006604

dedicated to filtration science...

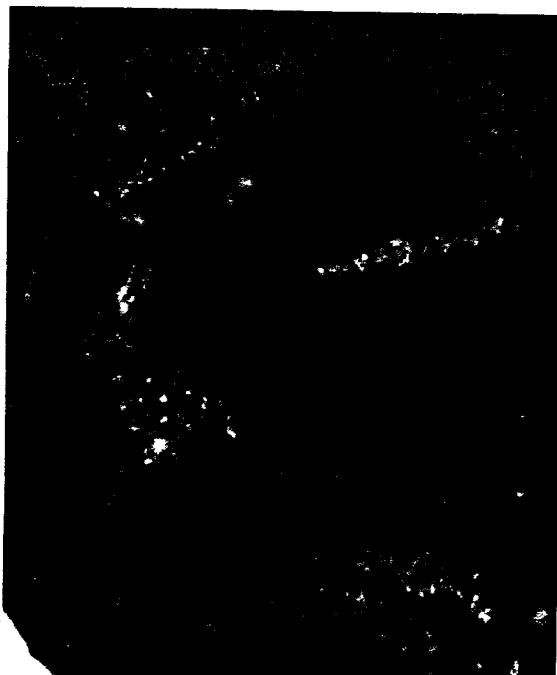


PHOTO E - FIBER ENCAPSULATION



PHOTO F - GOOD COLLAPSE PATTERN

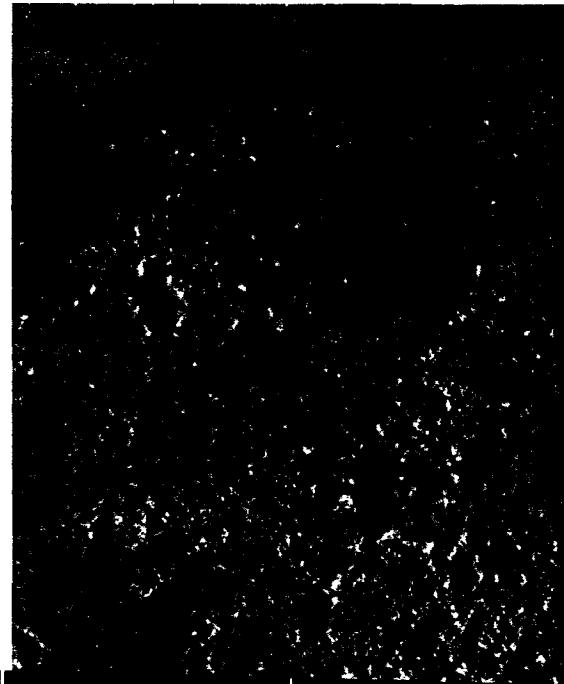
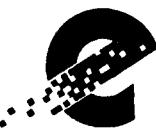


PHOTO G - GOOD RELEASE/LOW NODULA



Prepared for: INTERMOUNTAIN POWER COMPANY

:

:

Date:

TLN : 7774

Page: 1

Identification: 1-C-16-0-20

Fiber Content: ECDE

Fabric Construction: WOVEN

Weave: 3 X 1 TWILL Count: 44 X 24

Yarn System- Warp/Length: 37-1/0F

Filling Width: 75-1/2T+75-1/0F

Avg. Weight [oz/sq yd]: 13.59 Thickness [inches]: .013 Density Factor: .749

Treatment- Physical Type: NONE

Chemical Type: A.R.

% Ignition Loss [LOI] ---> 500°F/1 Hr: 0.12% 1150°F/1 Hr: 4.43%

% Extractable Matter: SULPHATES

Acid Alkaline [PH]: 11.64

Fabrication

Seaming: CHAIN

Hardware: C.R.

Cuffing: LOCK

Sewing Thread: ECB

Ring Cover: CHAIN

Fabrication Rating: GOOD

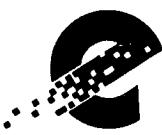
PROFILE DATA

TOP

CENTER

BOTTOM

Weight [oz/sq yd]	As Received	23.28	23.19	12.35 19.58
	Cleaned (Vacuum)	16.75	16.62	16.28 16.55
	Cleaned (Washed)	13.60	13.59	13.59 13.593
Permeability	As received	2.18	2.25	2.37 2.26
CFM/sq ft	Cleaned (Vacuum)	7.5	8.0	8.3 7.93
@ .5" H2O	Cleaned (Washed)	50.5	53.8	55.6 53.3
Breaking Strength lbs/inch	Warp/Length	400	405	398 401
	Filling/Width	221	231	219 223.1
Breaking Strength % Loss	Warp/Length	604	33.77%	34.11% 33.61%
	Filling/Width	349	36.68%	33.81% 35.91
Mullen Burst (lbs/sq inch)		587	594	581 587 587.3
Mullen Burst % Loss	823	28.68%	27.83%	29.40% 28.64
Flex Cycles [MIT Method]	Warp	22482	21983	21715 22060
	Fill	1952	1908	1871 1903
Flex Cycles % Loss	Warp 49871	54.92%	55.92%	56.46% 55.77
	Fill 3698	47.21%	48.41%	49.41% 48.343
Other Testing				



Prepared for: INTERMOUNTAIN POWER COMPANY

:

:

Date:

TLN : 7774

Page: 2

Identification: 1-C-1-J-1

Fiber Content: ECDE

Fabric Construction: WOVEN

Weave: 3 X 1 TWILL

Count: 44 X 24

Yarn System- Warp/Length: 37-1/0F

Filling Width: 75-1/2T+75-1/0F

Avg. Weight [oz/sq yd]: 13.59 Thickness [inches]: .014 Density Factor: .749

Treatment- Physical Type: NONE

Chemical Type: A.R.

% Ignition Loss [LOI] ---> 500°F/1 Hr: 0.11% 1150°F/1 Hr: 4.58%

% Extractable Matter: SULPHATES

Acid Alkaline [PH]: 11.64

Fabrication

Seaming: CHAIN

Hardware: C.R.

Cuffing: LOCK

Sewing Thread: ECB

Ring Cover: CHAIN

Fabrication Rating: GOOD

PROFILE DATA

TOP

CENTER

BOTTOM

	As Received	23.25	23.11	22.58
Weight [oz/sq yd]	Cleaned (Vacuum)	17.19	16.98	16.86
	Cleaned (Washed)	13.57	13.61	13.62
Permeability	As received	2.21	2.27	2.31 2.263
CFM/sq ft	Cleaned (Vacuum)	7.6	7.8	8.1 7.83
@ .5" H2O	Cleaned (Washed)	46.9	48.3	46.8 47.3
Breaking Strength lbs/inch	Warp/Length	411	413	407 410.3
	Filling/Width	230	240	237 235.6
Breaking Strength % Loss	Warp/Length	604	31.95%	32.62% 32.963
	Filling/Width	349	34.10%	31.23% 32.09% 32.473
Mullen Burst (lbs/sq inch)		605	601	608 604.6
Mullen Burst % Loss	823	26.49%	26.97%	26.12% 26.526
Flex Cycles [MIT Method]	Warp	23518	24471	23258 23749
	Fill	1853	1793	1879 1841.6
Flex Cycles % Loss	Warp	49871	50.93%	53.36% 52.376
	Fill	3698	49.89%	49.19% 50.196
Other Testing				



Prepared for: INTERMOUNTAIN POWER COMPANY

:

:

Date:

TLN : 7774

Page: 3

Identification: 1-B-14-D-3

Fiber Content: ECDE

Fabric Construction: WOVEN Weave: 3 X 1 TWILL Count: 44 X 24

Yarn System- Warp/Length: 37-1/0F Filling Width: 75-1/2T+75-1/0F

Avg. Weight [oz/sq yd]: 13.63 Thickness [inches]: .013 Density Factor: .749

Treatment- Physical Type: NONE Chemical Type: A.R.

% Ignition Loss [LOI] ---> 500°F/1 Hr: 0.06% 1150°F/1 Hr: 4.21%

% Extractable Matter: SULPHATES Acid Alkaline [PH]: 11.64

Fabrication Seaming: CHAIN Hardware: C.R.
Cuffing: LOCK Sewing Thread: ECB
Ring Cover: CHAIN Fabrication Rating: GOOD

PROFILE DATA		TOP	CENTER	BOTTOM
Weight [oz/sq yd]	As Received	23.26	23.11	22.95
	Cleaned (Vacuum)	17.40	17.42	17.12
	Cleaned (Washed)	13.61	13.60	13.67
Permeability	As received	2.11	2.19	2.35
CFM/sq ft	Cleaned (Vacuum)	7.4	7.5	8.0
@ .5" H2O	Cleaned (Washed)	50.9	53.6	48.9
Breaking Strength lbs/inch	Warp/Length	404	414	407 408.3
	Filling/Width	238	235	231 234.6
Breaking Strength % Loss	Warp/Length	604	33.11%	31.46% 32.62%
	Filling/Width	349	31.81%	32.66% 33.81%
Mullen Burst (lbs/sq inch)		598	590	584 591
Mullen Burst % Loss		823	27.34%	28.31% 29.04%
Flex Cycles [MIT Method]	Warp	23008	23715	22849 23,190.6
	Fill	1741	1803	1671 1738.3
Flex Cycles % Loss	Warp	49871	53.86%	52.45% 54.18%
	Fill	3698	52.92%	51.24% 54.81%
Other Testing				



Prepared for: INTERMOUNTAIN POWER COMPANY

Date: 7774
TLN : 4

Identification: 1-B-4-J-21

Fiber Content: ECDE

Fabric Construction: WOVEN Weave: 3 X 1 TWILL Count: 44 X 24

Yarn System- Warp/Length: 37-1/0F Filling Width: 75-1/2T+75-1/0F

Avg. Weight [oz/sq yd]: 13.65 Thickness [inches]: .045 Density Factor: .752

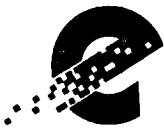
Treatment- Physical Type: NONE Chemical Type: A.R.

% Ignition Loss [LOI] ---> 500°F/1 Hr: 0.08% 1150°F/1 Hr: 4.71%

% Extractable Matter: SULPHATES Acid Alkaline [PH]: 11.68

Fabrication Seaming: CHAIN Hardware: C.R.
Cuffing: LOCK Sewing Thread: ECB
Ring Cover: CHAIN Fabrication Rating: GOOD

PROFILE DATA		TOP	CENTER	BOTTOM
Weight [oz/sq yd]	As Received	23.25	23.18	23.08
	Cleaned (Vacuum)	17.32	17.28	17.05
	Cleaned (Washed)	13.66	13.64	13.66
Permeability	As received	2.08	2.21	2.28
CFM/sq ft	Cleaned (Vacuum)	7.4	7.5	7.6
@ .5" H2O	Cleaned (Washed)	49.5	53.6	51.9
Breaking Strength lbs/inch	Warp/Length	419	423	409 417
	Filling/Width	236	240	233 236.3
Breaking Strength % Loss	Warp/Length	604	30.64%	29.97% 32.28%
	Filling/Width	349	32.38%	31.23% 33.24%
Mullen Burst (lbs/sq inch)		590	591	583 588.0
Mullen Burst % Loss	823	28.31%	28.19%	29.16%
Flex Cycles [MIT Method]	Warp	23426	23682	23172 23426.6
	Fill	1749	1781	1719 1749.6
Flex Cycles % Loss	Warp	49871	53.05%	52.51% 53.54%
	Fill	3698	52.70%	51.84% 53.52%
Other Testing				



Prepared for: INTERMOUNTAIN POWER COMPANY

:

:

Date: 7774
TLN : 7774
Page: 5

Identification: 1-B-8-N-21

Fiber Content: ECDE

Fabric Construction: WOVEN

Weave: 3 X 1 TWILL Count: 43 X 24

Yarn System- Warp/Length: 37-1/0F

Filling Width: 75-1/2T+75-1/0F

Avg. Weight [oz/sq yd]: 13.58 Thickness [inches]: .014 Density Factor: .748

Treatment- Physical Type: NONE

Chemical Type: A.R.

% Ignition Loss [LOI] ---> 500°F/1 Hr: 0.14% 1150°F/1 Hr: 4.73%

% Extractable Matter: SULPHATES

Acid Alkaline [PH]: 11.68

Fabrication

Seaming: CHAIN

Hardware: C.R.

Cuffing: LOCK

Sewing Thread: ECB

Ring Cover: CHAIN

Fabrication Rating: GOOD

PROFILE DATA

TOP

CENTER

BOTTOM

	As Received	23.30	23.24	23.11
Weight [oz/sq yd]	Cleaned (Vacuum)	17.21	17.29	16.87
	Cleaned (Washed)	13.55	13.59	13.60
Permeability	As received	2.11	2.19	2.31
CFM/sq ft	Cleaned (Vacuum)	7.6	7.6	7.9
@ .5" H2O	Cleaned (Washed)	48.3	49.0	47.5
Breaking Strength lbs/inch	Warp/Length	415	417	410 414.0
	Filling/Width	232	239	234 235.0
Breaking Strength % Loss	Warp/Length	604	31.29%	30.96% 32.12%
	Filling/Width	349	33.56%	31.52% 32.95%
Mullen Burst (lbs/sq inch)		585	591	587 587.500
Mullen Burst % Loss	823	28.92%	28.19%	28.68%
Flex Cycles [MIT Method]	Warp	23056	22759	22431 2248.6
	Fill	1809	1820	1728 1785.6
Flex Cycles % Loss	Warp	49871	53.77%	54.36% 55.02%
	Fill	3698	51.08%	50.78% 53.27%
Other Testing				



Prepared for: INTERMOUNTAIN POWER COMPANY

:

:

Date:

TLN : 7774

Page: 6

Identification: 1-A-16-P-20

Fiber Content: ECDE

Fabric Construction: WOVEN

Weave: 3 X 1 TWILL Count: 44 X 24

Yarn System- Warp/Length: 37-1/0F

Filling Width: 75-1/2T+75-1/0F

Avg. Weight [oz/sq yd]: 13.64 Thickness [inches]: .014 Density Factor: .810

Treatment- Physical Type: NONE

Chemical Type: A.R.

% Ignition Loss [LOI] ---> 500°F/1 Hr: 0.21% 1150°F/1 Hr: 4.71%

% Extractable Matter: SULPHATES

Acid Alkaline [PH]: 11.58

Fabrication

Seaming: CHAIN

Hardware: C.R.

Cuffing: LOCK

Sewing Thread: ECB

Ring Cover: CHAIN

Fabrication Rating: GOOD

PROFILE DATA

TOP

CENTER

BOTTOM

Weight [oz/sq yd]	As Received	23.39	23.41	23.30
	Cleaned (Vacuum)	17.34	17.19	17.14
	Cleaned (Washed)	13.61	13.67	13.66
Permeability	As received	1.75	2.08	2.11
CFM/sq ft	Cleaned (Vacuum)	7.0	7.4	7.5
@ .5" H2O	Cleaned (Washed)	48.3	49.1	50.7
Breaking Strength lbs/inch	Warp/Length	428	411	410 416.3
	Filling/Width	238	244	239 240.3
Breaking Strength % Loss	Warp/Length	604	29.14%	31.95%
	Filling/Width	349	31.81%	30.09%
Mullen Burst (lbs/sq inch)		609	598	604 603.6
Mullen Burst % Loss	823	26.00%	27.34%	26.61%
Flex Cycles [MIT Method]	Warp	22815	21491	21268 21,858
	Fill	1801	1743	1757 1767
Flex Cycles	Warp	49871	54.25%	56.91%
% Loss	Fill	3698	51.30%	52.87%
Other Testing				

Prepared for: INTERMOUNTAIN POWER COMPANY

Date:
TLN : 7774
Page: 7

Identification: 2-C-16-P-20

Fiber Content: ECDE

Fabric Construction: WOVEN

Weave: 3 X 1 TWILL Count: 44 X 24

Yarn System- Warp/Length: 37-1/0F

Filling Width: 75-1/2T+75-1/0F

Avg. Weight [oz/sq yd]: 13.62 Thickness [inches]: .014 Density Factor: .751

Treatment- Physical Type: NONE

Chemical Type: A.R.

% Ignition Loss [LOI] ---> 500°F/1 Hr: 0.09% 1150°F/1 Hr: 4.53%

% Extractable Matter: SULPHATES

Acid Alkaline [PH]: 11.64

Fabrication

Seaming: CHAIN

Hardware: C.R.

Cuffing: LOCK

Sewing Thread: ECB

Ring Cover: CHAIN

Fabrication Rating: GOOD

PROFILE DATA

TOP

CENTER

BOTTOM

	As Received	24.17	23.71	23.25
Weight [oz/sq yd]	Cleaned (Vacuum)	17.62	17.29	17.04
	Cleaned (Washed)	13.60	13.64	13.63
Permeability	As received	1.20	1.98	2.23
CFM/sq ft	Cleaned (Vacuum)	6.4	7.0	7.5
@ .5" H2O	Cleaned (Washed)	47.3	48.2	48.5
Breaking Strength lbs/inch	Warp/Length	464	468	465 465.6
	Filling/Width	259	263	261 261.0
Breaking Strength % Loss	Warp/Length	604	23.18%	22.52% 23.01%
	Filling/Width	349	25.79%	24.64% 25.21%
Mullen Burst (lbs/sq inch)		655	648	651 651.3
Mullen Burst % Loss	823	20.41%	21.26%	20.90%
Flex Cycles [MIT Method]	Warp	27581	28005	27437 27674.3
	Fill	1974	2104	1948 2008.6
Flex Cycles % Loss	Warp	49871	44.70%	43.85% 44.98%
	Fill	3698	46.62%	43.10% 47.32%
Other Testing				



Prepared for: INTERMOUNTAIN POWER COMPANY

Date:

TLN : 7774

Page: 8

Identification: 2-C-1-J-1

Fiber Content: ECDE

Fabric Construction: WOVEN

Weave: 3 X 1 TWILL Count: 43 X 24

Yarn System- Warp/Length: 37-1/0F

Filling Width: 75-1/2T+75-1/0F

Avg. Weight [oz/sq yd]: 13.56 Thickness [inches]: .013 Density Factor: .805

Treatment- Physical Type: NONE

Chemical Type: A.R.

% Ignition Loss [LOI] ---> 500°F/1 Hr: 0.14% 1150°F/1 Hr: 4.39%

% Extractable Matter: SULPHATES

Acid Alkaline [PH]: 11.71

Fabrication

Seaming: CHAIN

Hardware: C.R.

Cuffing: LOCK

Sewing Thread: ECB

Ring Cover: CHAIN

Fabrication Rating: GOOD

PROFILE DATA

TOP

CENTER

BOTTOM

Weight [oz/sq yd]	As Received		23.98	23.64	23.08
	Cleaned (Vacuum)		17.41	17.32	17.21
	Cleaned (Washed)		13.57	13.57	13.53
Permeability	As received		1.25	1.89	2.15
CFM/sq ft	Cleaned (Vacuum)		6.7	6.9	7.0
@ .5" H2O	Cleaned (Washed)		48.5	50.3	47.6
Breaking Strength lbs/inch	Warp/Length		469	468	465 467.3
	Filling/Width		268	271	265 268.0
Breaking Strength % Loss	Warp/Length	604	22.35%	22.50%	23.01%
	Filling/Width	349	23.21%	22.35%	24.07%
Mullen Burst (lbs/sq inch)			653	651	657 653.4
Mullen Burst % Loss	823		20.66%	20.90%	20.17%
Flex Cycles [MIT Method]	Warp		28431	27983	27405 27939.6
	Fill		2135	2101	2009 2081.6
Flex Cycles % Loss	Warp	49871	42.99%	43.89%	45.05%
	Fill	3698	42.27%	43.19%	45.67%
Other Testing					



Prepared for: INTERMOUNTAIN POWER COMPANY

Date:

TLN : 7774

Page: 9

Identification: 2-B-13-D-3

Fiber Content: ECDE

Fabric Construction: WOVEN

Weave: 3 X 1 TWILL Count: 44 X 24

Yarn System- Warp/Length: 37-1/0F

Filling Width: 75-1/2T+75-1/0F

Avg. Weight [oz/sq yd]: 13.66 Thickness [inches]: .014 Density Factor: .753

Treatment- Physical Type: NONE

Chemical Type: A.R.

% Ignition Loss [LOI] ---> 500°F/1 Hr: 0.19% 1150°F/1 Hr: 4.80%

% Extractable Matter: SULPHATES

Acid Alkaline [PH]: 11.62

Fabrication

Seaming: CHAIN

Hardware: C.R.

Cuffing: LOCK

Sewing Thread: ECB

Ring Cover: CHAIN

Fabrication Rating: GOOD

PROFILE DATA

TOP

CENTER

BOTTOM

Weight [oz/sq yd]	As Received	24.01	23.53	23.19
	Cleaned (Vacuum)	17.73	17.48	17.28
	Cleaned (Washed)	13.67	13.65	13.65
Permeability	As received	1.40	2.20	2.41
CFM/sq ft	Cleaned (Vacuum)	6.7	7.3	7.8
@ .5" H2O	Cleaned (Washed)	47.9	49.3	48.2
Breaking Strength lbs/inch	Warp/Length	476	479	478.0
	Filling/Width	280	283	279.6
Breaking Strength % Loss	Warp/Length	604	21.19%	20.70%
	Filling/Width	349	19.77%	18.91%
Mullen Burst (lbs/sq inch)		661	659	654 658.0
Mullen Burst % Loss	823	19.68%	19.93%	20.53%
Flex Cycles [MIT Method]	Warp	27430	27782	28623 27,945
	Fill	2114	2087	2049 2083.3
Flex Cycles % Loss	Warp	49871	44.99%	44.29%
	Fill	3698	42.83%	43.56%
Other Testing				



Prepared for: INTERMOUNTAIN POWER COMPANY

:

:

Date:

TLN : 7774

Page: 10

Identification: 2-B-13-C-3

Fiber Content: ECDE

Fabric Construction: WOVEN

Weave: 3 X 1 TWILL

Count: 43 X 24

Yarn System- Warp/Length: 37-1/0F

Filling Width: 75-1/2T+75-1/0F

Avg. Weight [oz/sq yd]: 13.70 Thickness [inches]: .014 Density Factor: .755

Treatment- Physical Type: NONE

Chemical Type: A.R.

% Ignition Loss [LOI] ---> 500°F/1 Hr: 0.21% 1150°F/1 Hr: 4.80%

% Extractable Matter: SULPHATES

Acid Alkaline [PH]: 11.64

Fabrication

Seaming: CHAIN

Hardware: C.R.

Cuffing: LOCK

Sewing Thread: ECB

Ring Cover: CHAIN

Fabrication Rating: GOOD

PROFILE DATA

TOP

CENTER

BOTTOM

Weight [oz/sq yd]	As Received	24.18	23.62	23.29
	Cleaned (Vacuum)	17.70	17.53	17.44
	Cleaned (Washed)	13.68	13.71	13.71
Permeability	As received	1.31	2.17	2.31
CFM/sq ft	Cleaned (Vacuum)	6.9	7.2	7.5
@ .5" H2O	Cleaned (Washed)	49.5	48.7	50.8
Breaking Strength lbs/inch	Warp/Length	481	483	478 480.6
	Filling/Width	273	280	278 277.0
Breaking Strength % Loss	Warp/Length	604	20.36%	20.03% 20.86%
	Filling/Width	349	21.78%	19.77% 20.34%
Mullen Burst (lbs/sq inch)		658	663	661 660.6
Mullen Burst % Loss	823	20.05%	19.44%	19.68%
Flex Cycles [MIT Method]	Warp	27849	29513	28008 28456.6
	Fill	2015	2036	2098 2049.6
Flex Cycles % Loss	Warp	49871	44.16%	40.82% 43.84%
	Fill	3698	45.51%	44.94% 43.67%
Other Testing				



Prepared for: INTERMOUNTAIN POWER COMPANY

:

:

Date:

TLN : 7774

Page: 11

Identification: 2-A-5-P-2

Fiber Content: ECDE

Fabric Construction: WOVEN

Weave: 3 X 1 TWILL Count: 44 X 24

Yarn System- Warp/Length: 37-1/0F

Filling Width: 75-1/2T+75-1/0F

Avg. Weight [oz/sq yd]: 13.71 Thickness [inches]: .014 Density Factor: .756

Treatment- Physical Type: NONE

Chemical Type: A.R.

% Ignition Loss [LOI] ---> 500°F/1 Hr: 0.20% 1150°F/1 Hr: 4.59%

% Extractable Matter: SULPHATES

Acid Alkaline [PH]: 11.71

Fabrication

Seaming: CHAIN

Hardware: C.R.

Cuffing: LOCK

Sewing Thread: ECB

Ring Cover: CHAIN

Fabrication Rating: GOOD

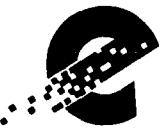
PROFILE DATA

TOP

CENTER

BOTTOM

Weight [oz/sq yd]	As Received	24.19	23.56	23.32
	Cleaned (Vacuum)	17.58	17.49	17.46
	Cleaned (Washed)	13.73	13.65	13.72
Permeability	As received	1.27	2.01	2.20
CFM/sq ft	Cleaned (Vacuum)	6.0	7.0	7.3
@ .5" H2O	Cleaned (Washed)	48.3	49.1	47.5
Breaking Strength lbs/inch	Warp/Length	479	480	471 476.6
	Filling/Width	276	279	270 275.0
Breaking Strength % Loss	Warp/Length	604	20.70%	20.53% 22.02%
	Filling/Width	349	20.92%	20.06% 22.64%
Mullen Burst (lbs/sq inch)		654	655	652 659.6
Mullen Burst % Loss	823	20.53%	20.41%	20.78%
Flex Cycles [MIT Method]	Warp	28013	28989	27859 28287
	Fill	2112	2074	2051 2079
Flex Cycles	Warp	49871	43.83%	41.87% 44.14%
% Loss	Fill	3698	42.89%	43.89% 45.51%
Other Testing				



Prepared for: INTERMOUNTAIN POWER COMPANY

Date:
TLN : 7774
Page: 12

Identification: 2-A-15-D-22

Fiber Content: ECDE

Fabric Construction: WOVEN Weave: 3 X 1 TWILL Count: 44 X 24

Yarn System- Warp/Length: 37-1/0F Filling Width: 75-1/2T+75-1/0F

Avg. Weight [oz/sq yd]: 13.64 Thickness [inches]: .013 Density Factor: .810

Treatment- Physical Type: NONE Chemical Type: A.R.

% Ignition Loss [LOI] ---> 500°F/1 Hr: 0.13% 1150°F/1 Hr: 4.48%

% Extractable Matter: SULPHATES Acid Alkaline [PH]: 11.75

Fabrication	Seaming: CHAIN Cuffing: LOCK Ring Cover: CHAIN	Hardware: C.R. Sewing Thread: ECB Fabrication Rating: GOOD
-------------	--	--

PROFILE DATA		TOP	CENTER	BOTTOM
Weight [oz/sq yd]	As Received	24.01	23.43	23.15
	Cleaned (Vacuum)	17.36	17.10	17.19
	Cleaned (Washed)	13.65	13.64	13.64
Permeability	As received	1.21	2.18	2.31
CFM/sq ft	Cleaned (Vacuum)	6.4	7.5	7.5
@ .5" H2O	Cleaned (Washed)	47.5	48.3	50.6
Breaking Strength lbs/inch	Warp/Length	484	489	483 485.3
	Filling/Width	281	284	280 281.6
Breaking Strength % Loss	Warp/Length	604	19.87%	19.04% 20.03%
	Filling/Width	349	19.48%	18.63% 19.77%
Mullen Burst (lbs/sq inch)		662	660	661 661.0
Mullen Burst % Loss	823	19.56%	19.81%	19.68%
Flex Cycles [MIT Method]	Warp	28985	30082	28563 2921D
	Fill	2091	2173	2108 2124
Flex Cycles % Loss	Warp	49871	41.88%	39.68% 42.73%
	Fill	3698	43.46%	41.24% 42.99%
Other Testing				



Prepared for: INTERMOUNTAIN POWER COMPANY

:

:

Date:

TLN : 7774

Page: 13

Identification: 2-B-4-J-21

Fiber Content: ECDE

Fabric Construction: WOVEN Weave: 3 X 1 TWILL Count: 44 X 24

Yarn System- Warp/Length: 37-1/0F Filling Width: 75-1/2T+75-1/0F

Avg. Weight [oz/sq yd]: 13.69 Thickness [inches]: .014 Density Factor: .755

Treatment- Physical Type: NONE Chemical Type: A.R.

% Ignition Loss [LOI] ---> 500°F/1 Hr: 0.16% 1150°F/1 Hr: 4.73%

% Extractable Matter: SULPHATES Acid Alkaline [PH]: 11.59

Fabrication	Seaming: CHAIN Cuffing: LOCK Ring Cover: CHAIN	Hardware: C.R. Sewing Thread: ECB Fabrication Rating: GOOD
-------------	--	--

PROFILE DATA		TOP	CENTER	BOTTOM
Weight [oz/sq yd]	As Received	23.98	23.24	23.04
	Cleaned (Vacuum)	17.49	17.18	17.08
	Cleaned (Washed)	13.70	13.71	13.67
Permeability	As received	1.28	2.15	2.32
CFM/sq ft	Cleaned (Vacuum)	5.9	7.7	7.9
@ .5" H2O	Cleaned (Washed)	51.3	49.2	50.5
Breaking Strength lbs/inch	Warp/Length	493	487	486 488.6
	Filling/Width	279	283	279 280.3
Breaking Strength % Loss	Warp/Length	604	18.38%	19.37% 19.54%
	Filling/Width	349	20.06%	19.91% 20.06%
Mullen Burst (lbs/sq inch)		668	670	664 667.3
Mullen Burst % Loss	823	18.83%	18.91%	20.06%
Flex Cycles [MIT Method]	Warp	29987	31013	30708 30569.3
	Fill	2308	2257	2210 2258.3
Flex Cycles % Loss	Warp	49871	39.87%	37.81% 38.43%
	Fill	3698	37.59%	38.97% 40.24%
Other Testing				

March 16, 1990
TLN 7774

NEW FILTER BAG

FIBER	ECDE
WEAVE	3 X 1 TWILL
COUNT (W X F)	44 X 24
WEIGHT (OZ/SQ YD)	13.42
THICKNESS (INCHES)	.013
YARN CONSTRUCTION	
WARP/LENGTH	37-1/0F
FILL/WIDTH	75-1/2T+75-1/0F
PERMEABILITY (CFM @ 5" \P)	48.3
MULLEN BURST (LBS/SQ INCH)	<u>823</u>
TENSILE STRENGTH (LBS/INCH)	
WARP/LENGTH	604
FILL/WIDTH	349
FLEX CYCLES (.04 JAW @ 4 LBS)	
WARP/LENGTH	49871
FILL/WIDTH	3698
FINISH	ACID RESISTANCE
ACID CYCLE LOSS (IN H ₂ SO ₄ - 5 CYCLES)	43.71%
LOSS ON IGNITION	
500°F	0.12%
1150°F	4.43%
WATER REPELLENCY (MIN)	30+
FINISH CURE	FULL CURE
OVERALL QUALITY	GOOD

IP12_006619

March 16, 1990
TLN 7774
Section III

PARTICLE SIZE SUMMARY
TOP DUST

VOLUME:

0.100% OF THE VOLUME IS BELOW 0.509 MICRONS
1.000% OF THE VOLUME IS BELOW 0.993 MICRONS
6.000% OF THE VOLUME IS BELOW 2.347 MICRONS
22.000% OF THE VOLUME IS BELOW 6.615 MICRONS
50.000% OF THE VOLUME IS BELOW 21.30 MICRONS
78.000% OF THE VOLUME IS BELOW 46.00 MICRONS
94.000% OF THE VOLUME IS BELOW 54.86 MICRONS
99.000% OF THE VOLUME IS BELOW 69.41 MICRONS
99.900% OF THE VOLUME IS BELOW 70.47 MICRONS

POPULATION:

0.100% OF THE POPULATION IS BELOW 0.222 MICRONS
1.000% OF THE POPULATION IS BELOW 0.235 MICRONS
6.000% OF THE POPULATION IS BELOW 0.282 MICRONS
22.000% OF THE POPULATION IS BELOW 0.428 MICRONS
50.000% OF THE POPULATION IS BELOW 0.708 MICRONS
78.000% OF THE POPULATION IS BELOW 1.221 MICRONS
94.000% OF THE POPULATION IS BELOW 2.351 MICRONS
99.000% OF THE POPULATION IS BELOW 4.984 MICRONS
99.900% OF THE POPULATION IS BELOW 11.37 MICRONS

INTERMOUNTAIN POWER TOP DUST

Date: 14 Mar 90 Oper ID: WB Sample Nr: 7774

Current	Gain	Calib.	Orifice	Flow Pr.	Volume	Timer	Peak	Total
4.5	2.0	0.204 / 1.005773	150.070 um	160.0 mm	100.0 ul	32.0 secs	3200	8000000

geometric mean size = 0.767 arithmetic mean size = 1.008
 standard deviation = 1.141 coeff. of variation = 148.6 skewness = 7.550e-02
 median size = 0.724 mode size = 0.681

Coincidence Corrected: No

Total = 3.251550000e+05

Chnl	Size	Counts	% <	Chnl	Size	Counts	% <	Chnl	Size	Counts	% <	Chnl	Size	Counts	% <
1	0.208	0	0.000	33	0.909	8228	63.14	65	3.970	687	98.13	97	17.33	13	99.96
2	0.218	0	0.000	34	0.952	7850	65.61	66	4.157	608	98.33	98	18.14	8	99.97
3	0.228	872	0.134	35	0.997	7487	67.97	67	4.353	579	98.51	99	19.00	3	99.97
4	0.239	3750	0.845	36	1.044	7122	70.22	68	4.558	478	98.68	100	19.90	15	99.97
5	0.250	4019	2.039	37	1.093	6761	72.35	69	4.773	459	98.82	101	20.83	12	99.97
6	0.262	4122	3.291	38	1.145	6583	74.40	70	4.997	387	98.95	102	21.81	10	99.98
7	0.275	4299	4.586	39	1.199	6192	76.37	71	5.233	363	99.06	103	22.84	9	99.98
8	0.288	4449	5.931	40	1.255	5766	78.21	72	5.480	276	99.16	104	23.92	6	99.98
9	0.301	4717	7.341	41	1.314	5473	79.93	73	5.738	295	99.25	105	25.05	7	99.98
10	0.315	4919	8.823	42	1.376	5178	81.57	74	6.008	263	99.34	106	26.23	6	99.99
11	0.330	5245	10.39	43	1.441	4730	83.10	75	6.291	263	99.42	107	27.46	2	99.99
12	0.346	5480	12.03	44	1.509	4313	84.49	76	6.588	220	99.49	108	28.76	7	99.99
13	0.362	5836	13.77	45	1.580	4227	85.80	77	6.898	174	99.55	109	30.11	3	99.99
14	0.379	6053	15.60	46	1.655	3823	87.04	78	7.224	153	99.60	110	31.53	3	99.99
15	0.397	6489	17.53	47	1.733	3485	88.16	79	7.564	132	99.65	111	33.02	5	99.99
16	0.416	6709	19.56	48	1.814	3234	89.19	80	7.920	143	99.69	112	34.57	1	99.99
17	0.435	7008	21.67	49	1.900	3108	90.17	81	8.294	125	99.73	113	36.20	2	99.99
18	0.456	7321	23.87	50	1.990	2767	91.07	82	8.685	82	99.76	114	37.91	2	100.0
19	0.477	7551	26.16	51	2.083	2500	91.38	83	9.094	91	99.79	115	39.70	4	100.0
20	0.500	7820	28.52	52	2.181	2304	92.62	84	9.522	80	99.81	116	41.57	0	100.0
21	0.523	8026	30.96	53	2.284	2152	93.31	85	9.971	69	99.84	117	43.53	1	100.0
22	0.548	8497	33.50	54	2.392	1895	93.93	86	10.44	71	99.86	118	45.58	0	100.0
23	0.574	8565	36.13	55	2.505	1785	94.50	87	10.93	57	99.88	119	47.73	3	100.0
24	0.601	8907	38.81	56	2.623	1670	95.03	88	11.45	51	99.90	120	49.98	4	100.0
25	0.629	8956	41.56	57	2.746	1597	95.53	89	11.99	33	99.91	121	52.33	1	100.0
26	0.659	8954	44.31	58	2.876	1344	95.98	90	12.55	26	99.92	122	54.80	1	100.0
27	0.690	9151	47.10	59	3.011	1272	96.38	91	13.14	25	99.93	123	57.38	0	100.0
28	0.722	8717	49.84	60	3.153	1161	96.76	92	13.76	28	99.93	124	60.08	0	100.0
29	0.756	8962	52.55	61	3.302	1024	97.09	93	14.41	26	99.94	125	62.92	0	100.0
30	0.792	8685	55.28	62	3.457	916	97.39	94	15.09	17	99.95	126	65.88	0	100.0
31	0.829	8717	57.95	63	3.620	380	97.67	95	15.80	16	99.95	127	68.99	1	100.0
32	0.868	8391	60.58	64	3.791	721	97.91	96	16.55	14	99.96	128	72.24	0	100.0

IP12_006621

INTERMOUNTAIN POWER TOP DUST

Date: 14 Mar 90 Oper ID: WB Sample Nr: 7774

Low at 1 0.208 0 High at 128 72.24 0

Top of scale is 12800

Graph of Diam Size vs. Differential Counts From channel 1 to 127 skip: 2

Coincidence Corrected: No

% <	Size	0	10	20	30	40	50	60	70	80	90	100
0.000	0.208	>*	.	.	.	.	.	.	.	.	.	.
0.845	0.239	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
4.586	0.275	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
8.823	0.315	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
13.77	0.362	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
19.56	0.416	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
26.16	0.477	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
33.50	0.548	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
41.56	0.629	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
49.84	0.722	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
57.95	0.829	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
65.61	0.952	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
72.35	1.093	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
21	1.255	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
55.10	1.441	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
87.04	1.655	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
90.17	1.900	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
92.62	2.181	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
94.50	2.505	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
95.98	2.876	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
97.09	3.302	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
97.91	3.791	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
98.51	4.353	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
98.95	4.997	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
99.25	5.738	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
99.49	6.588	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
99.65	7.564	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
99.76	8.685	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
99.84	9.971	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
99.90	11.45	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
99.93	13.14	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
99.95	15.09	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
99.96	17.33	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
99.97	19.90	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
99.98	22.84	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
99.99	26.23	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
99.99	30.11	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
99.99	34.57	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
100.0	39.70	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
.0	45.58	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
100.0	52.33	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
100.0	60.08	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
100.0	68.99	>- - -	- - -	- - -	*	.	.	.	.	.	.	.
		!.....!	!.....!	!.....!	!.....!	!.....!	!.....!	!.....!	!.....!	!.....!	!.....!	!.....!
% <	Size	0	10	20	30	40	50	60	70	80	90	100

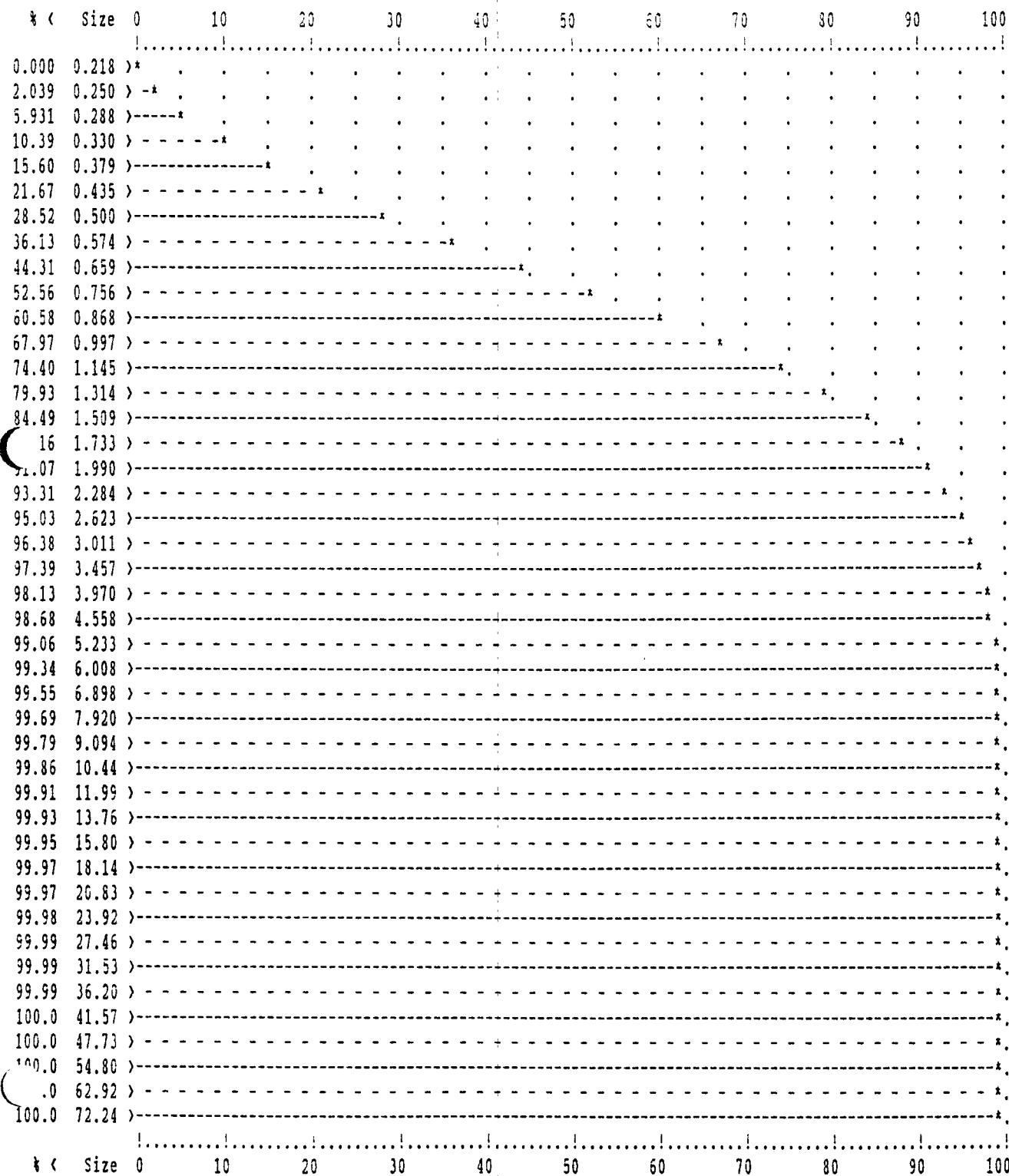
INTERMOUNTAIN POWER TOP DUST

Date: 14 Mar 90 Oper ID: WB Sample Nr: 7774

Low at 2 0.218 0 High at 128 72.24 0

Top of scale is 12800

Graph of Diam Size vs. Cumulative Counts From channel 2 to 128 skip: 2



INTERMOUNTAIN POWER TOP DUST

Date: 14 Mar 90 Oper ID: WB Sample Nr: 7774

Current	Gain	Calib.	Orifice	Flow Pr.	Volume	Timer	Peak	Total
4.5	2.0	- (um)	150.070 um	160.0 mm	100.0 ul	32.0 secs	3200	8000000

geometric mean size = 16.67 arithmetic mean size = 25.82
 standard deviation = 21.77 coeff. of variation = 130.6 skewness = -1.503e+00
 median size = 21.80 mode size = 49.39

Coincidence Corrected: No

Total = 6.779032790e+08

Chnl	Size	Volume	% <	Chnl	Size	Volume	% <	Chnl	Size	Volume	% <	Chnl	Size	Volume	% <
1	0.208	0	0.000	33	0.909	684395	0.727	65	3.970	4753153	12.24	97	17.33	7481366	43.82
2	0.218	0	0.000	34	0.952	749692	0.833	66	4.157	4829799	12.94	98	18.14	5286009	44.76
3	0.228	1150	0.000	35	0.997	820959	0.949	67	4.353	5280857	13.69	99	19.00	2275934	45.31
4	0.239	5676	0.001	36	1.044	896635	1.076	68	4.558	5095577	14.45	100	19.90	13065619	46.45
5	0.250	6984	0.002	37	1.093	977294	1.214	69	4.773	5518732	15.22	101	20.83	12001082	48.30
6	0.262	8225	0.003	38	1.145	1092543	1.367	70	4.997	5342419	16.02	102	21.81	11482581	50.03
7	0.275	9848	0.004	39	1.199	1179902	1.534	71	5.233	5753525	16.84	103	22.84	11865402	51.75
8	0.288	11702	0.006	40	1.255	1261508	1.714	72	5.480	5022696	17.64	104	23.92	9082211	53.29
9	0.301	14245	0.007	41	1.314	1374805	1.909	73	5.738	6163823	18.46	105	25.05	12165746	54.86
10	0.315	17056	0.010	42	1.376	1493407	2.120	74	6.008	6309345	19.38	106	26.23	11972708	56.64
11	0.330	20881	0.013	43	1.441	1566310	2.346	75	6.291	7244104	20.38	107	27.46	4582174	57.86
12	0.346	25049	0.016	44	1.509	1639821	2.583	76	6.588	6957480	21.43	108	28.76	18413654	59.56
13	0.362	30628	0.020	45	1.580	1845226	2.840	77	6.898	6317990	22.41	109	30.11	9060738	61.59
14	0.379	36473	0.025	46	1.655	1916117	3.117	78	7.224	6378544	23.35	110	31.53	10403129	63.02
15	0.397	44893	0.031	47	1.733	2005492	3.406	79	7.564	6318360	24.28	111	33.02	19907335	65.26
16	0.416	53292	0.038	48	1.814	2136774	3.712	80	7.920	7858993	25.33	112	34.57	4571340	67.06
17	0.435	63915	0.047	49	1.900	2357761	4.043	81	8.294	7887534	26.49	113	36.20	10497210	68.17
18	0.456	76661	0.057	50	1.990	2410063	4.395	82	8.685	5940808	27.51	114	37.91	12052420	69.84
19	0.477	90784	0.070	51	2.083	2500113	4.757	83	9.094	7569609	28.51	115	39.70	27676084	72.77
20	0.500	107948	0.084	52	2.181	2645468	5.137	84	9.522	7640511	29.63	116	41.57	0	74.81
21	0.523	127206	0.102	53	2.284	2837022	5.541	85	9.971	7566272	30.75	117	43.53	9121062	75.48
22	0.548	154623	0.122	54	2.392	2868336	5.962	86	10.44	8939054	31.97	118	45.58	0	76.15
23	0.574	178952	0.147	55	2.505	3102126	6.402	87	10.93	8239645	33.23	119	47.73	36071772	78.81
24	0.601	213669	0.176	56	2.623	3332254	6.877	88	11.45	8464556	34.47	120	49.98	55221296	85.55
25	0.629	246674	0.210	57	2.746	3658701	7.392	89	11.99	6288518	35.55	121	52.33	15850648	90.79
26	0.659	283157	0.249	58	2.876	3535262	7.923	90	12.55	5688636	36.44	122	54.80	18198996	93.30
27	0.690	332261	0.294	59	3.011	3841580	8.467	91	13.14	6280225	37.32	123	57.38	0	94.64
28	0.722	363394	0.346	60	3.153	4025829	9.047	92	13.76	8075950	38.38	124	60.08	0	94.64
29	0.756	428959	0.404	61	3.302	4076839	9.645	93	14.41	8610123	39.61	125	62.92	0	94.64
30	0.792	477289	0.471	62	3.457	4187159	10.25	94	15.09	6463761	40.72	126	65.88	0	94.64
31	0.829	550021	0.547	63	3.620	4618564	10.90	95	15.80	6984845	41.71	127	68.99	36311932	97.32
32	0.868	607891	0.632	64	3.791	4344702	11.57	96	16.55	7017222	42.75	128	72.24	0	100.0

IP12_006624

INTERMOUNTAIN POWER TOP DUST

Date: 14 Mar 90 Oper ID: WB Sample Nr: 7774

Low at 1 0.208 0 High at 128 72.24 0

Top of scale is 104857600

Graph of Diam Size vs. Differential Volume From channel 1 to 127 skip: 2

Coincidence Corrected: No

% <	Size	0	10	20	30	40	50	60	70	80	90	100
0.000	0.208 >*	.	.	.	.	.	.	.	.	.	.	.
0.001	0.239 >*	.	.	.	.	.	.	.	.	.	.	.
0.004	0.275 >*	.	.	.	.	.	.	.	.	.	.	.
0.010	0.315 >*	.	.	.	.	.	.	.	.	.	.	.
0.020	0.362 >*	.	.	.	.	.	.	.	.	.	.	.
0.038	0.416 >*	.	.	.	.	.	.	.	.	.	.	.
0.070	0.477 >*	.	.	.	.	.	.	.	.	.	.	.
0.122	0.548 >*	.	.	.	.	.	.	.	.	.	.	.
0.210	0.629 >*	.	.	.	.	.	.	.	.	.	.	.
0.346	0.722 >*	.	.	.	.	.	.	.	.	.	.	.
0.547	0.829 >*	.	.	.	.	.	.	.	.	.	.	.
0.833	0.952 >*	.	.	.	.	.	.	.	.	.	.	.
1.214	1.093 >*	.	.	.	.	.	.	.	.	.	.	.
1.714	1.255 > *	.	.	.	.	.	.	.	.	.	.	.
2.46	1.441 > -*	.	.	.	.	.	.	.	.	.	.	.
3.117	1.655 > *	.	.	.	.	.	.	.	.	.	.	.
4.043	1.900 >--*	.	.	.	.	.	.	.	.	.	.	.
5.137	2.181 > -*	.	.	.	.	.	.	.	.	.	.	.
6.402	2.505 >--*	.	.	.	.	.	.	.	.	.	.	.
7.923	2.876 > - *	.	.	.	.	.	.	.	.	.	.	.
9.645	3.302 >---*	.	.	.	.	.	.	.	.	.	.	.
11.57	3.791 > - -*	.	.	.	.	.	.	.	.	.	.	.
13.69	4.353 >----*	.	.	.	.	.	.	.	.	.	.	.
16.02	4.997 > - - *	.	.	.	.	.	.	.	.	.	.	.
18.46	5.738 >----*	.	.	.	.	.	.	.	.	.	.	.
21.43	6.588 > - - -*	.	.	.	.	.	.	.	.	.	.	.
24.28	7.564 >----*	.	.	.	.	.	.	.	.	.	.	.
27.51	8.685 > - - *	.	.	.	.	.	.	.	.	.	.	.
30.75	9.971 >----*	.	.	.	.	.	.	.	.	.	.	.
34.47	11.45 > - - -*	.	.	.	.	.	.	.	.	.	.	.
37.32	13.14 >----*	.	.	.	.	.	.	.	.	.	.	.
40.72	15.09 > - - -*	.	.	.	.	.	.	.	.	.	.	.
43.82	17.33 >----*	.	.	.	.	.	.	.	.	.	.	.
46.45	19.90 > - - - -*	.	.	.	.	.	.	.	.	.	.	.
51.75	22.84 >----*	.	.	.	.	.	.	.	.	.	.	.
56.64	26.23 > - - - -*	.	.	.	.	.	.	.	.	.	.	.
61.59	30.11 >----*	.	.	.	.	.	.	.	.	.	.	.
67.06	34.57 > - - *,	.	.	.	.	.	.	.	.	.	.	.
72.77	39.70 >-----*	.	.	.	.	.	.	.	.	.	.	.
75.15	45.58 >*	.	.	.	.	.	.	.	.	.	.	.
79.79	52.33 >-----*	.	.	.	.	.	.	.	.	.	.	.
94.64	60.08 >*	.	.	.	.	.	.	.	.	.	.	.
97.32	68.99 >-----*	.	.	.	.	.	.	.	.	.	.	.

IP12_006625

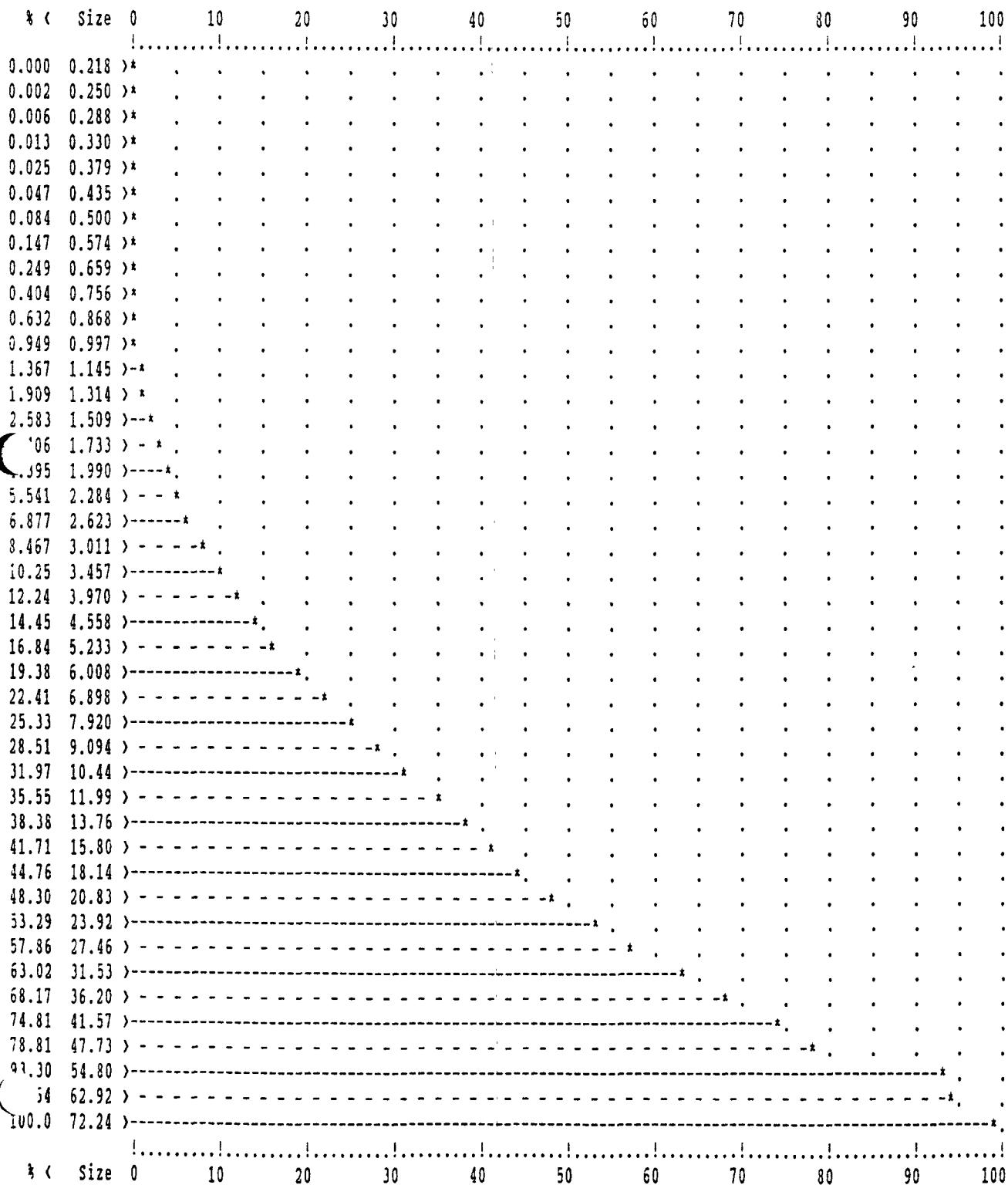
INTERMOUNTAIN POWER TOP DUST

Date: 14 Mar 90 Oper ID: WB Sample Nr: 7774

Low at 2 0.218 0 High at 128 72.24 0

Top of scale is 104857600

Graph of Diam Size vs. Cumulative Volume From channel 2 to 128 skip: 2



March 16, 1990
TLN 7774
Section IV

PARTICLE SIZE SUMMARY
MIDDLE DUST

VOLUME:

0.100% OF THE VOLUME IS BELOW 0.643 MICRONS
1.000% OF THE VOLUME IS BELOW 1.320 MICRONS
6.000% OF THE VOLUME IS BELOW 2.599 MICRONS
22.000% OF THE VOLUME IS BELOW 4.864 MICRONS
50.000% OF THE VOLUME IS BELOW 9.154 MICRONS
78.000% OF THE VOLUME IS BELOW 26.47 MICRONS
94.000% OF THE VOLUME IS BELOW 56.48 MICRONS
99.000% OF THE VOLUME IS BELOW 70.39 MICRONS
99.900% OF THE VOLUME IS BELOW 73.55 MICRONS

POPULATION:

0.100% OF THE POPULATION IS BELOW 0.222 MICRONS
1.000% OF THE POPULATION IS BELOW 0.236 MICRONS
6.000% OF THE POPULATION IS BELOW 0.296 MICRONS
22.000% OF THE POPULATION IS BELOW 0.495 MICRONS
50.000% OF THE POPULATION IS BELOW 0.962 MICRONS
78.000% OF THE POPULATION IS BELOW 2.023 MICRONS
94.000% OF THE POPULATION IS BELOW 4.048 MICRONS
99.000% OF THE POPULATION IS BELOW 7.383 MICRONS
99.900% OF THE POPULATION IS BELOW 13.24 MICRONS

INTERMOUNTAIN POWER MIDDLE DUST

Date: 14 Mar 90 Oper ID: WB Sample Nr: 7774

Current	Gain	Calib.	Orifice	Flow Pr.	Volume	Timer	Peak	Total
		-(um)						
4.5	2.0	0.204 / 1.005773	150.070 um	160.0 mm	100.0 ul	32.0 secs	3200	8000000

geometric mean size = 1.044 arithmetic mean size = 1.510
 standard deviation = 1.661 coeff. of variation = 159.2 skewness = 8.394e-02
 median size = 0.985 mode size = 0.904

Coincidence Corrected: No

Total = 6.302835000e+05

Chnl	Size	Counts	% <	Chnl	Size	Counts	% <	Chnl	Size	Counts	% <	Chnl	Size	Counts	% <
1	0.208	0	0.000	33	0.909	12776	46.59	65	3.970	4511	93.37	97	17.33	36	99.95
2	0.218	0	0.000	34	0.952	12356	48.58	66	4.157	4094	94.05	98	18.14	38	99.96
3	0.228	1781	0.141	35	0.997	12379	50.54	67	4.353	3843	94.68	99	19.00	30	99.97
4	0.239	6163	0.771	36	1.044	12072	52.48	68	4.558	3401	95.26	100	19.90	30	99.97
5	0.250	6253	1.756	37	1.093	11960	54.39	69	4.773	3294	95.79	101	20.83	21	99.97
6	0.262	6196	2.744	38	1.145	12016	56.29	70	4.997	2984	96.29	102	21.81	18	99.98
7	0.275	6272	3.733	39	1.199	11717	58.17	71	5.233	2661	96.74	103	22.84	19	99.98
8	0.288	6737	4.765	40	1.255	11587	60.02	72	5.480	2500	97.15	104	23.92	12	99.98
9	0.301	6957	5.851	41	1.314	11418	61.85	73	5.738	2194	97.52	105	25.05	15	99.99
10	0.315	7184	6.973	42	1.376	11163	63.64	74	6.008	1901	97.84	106	26.23	11	99.99
11	0.330	7636	8.149	43	1.441	10904	65.39	75	6.291	1689	98.13	107	27.46	12	99.99
12	0.346	8008	9.390	44	1.509	10721	67.10	76	6.588	1588	98.39	108	28.76	7	99.99
13	0.362	8441	10.69	45	1.580	10665	68.80	77	6.898	1359	98.62	109	30.11	3	99.99
14	0.379	8739	12.06	46	1.655	10319	70.47	78	7.224	1195	98.82	110	31.53	7	99.99
15	0.397	9253	13.48	47	1.733	9990	72.08	79	7.564	1090	99.00	111	33.02	9	99.99
16	0.416	9544	14.98	48	1.814	9854	73.65	80	7.920	878	99.16	112	34.57	11	99.99
17	0.435	10069	16.53	49	1.900	9850	75.21	81	8.294	808	99.29	113	36.20	5	100.0
18	0.456	10236	18.14	50	1.990	9270	76.73	82	8.685	699	99.41	114	37.91	3	100.0
19	0.477	10448	19.78	51	2.083	9333	78.21	83	9.094	543	99.51	115	39.70	4	100.0
20	0.500	11069	21.49	52	2.181	8734	79.64	84	9.522	501	99.60	116	41.57	1	100.0
21	0.523	11450	23.28	53	2.284	8546	81.01	85	9.971	414	99.67	117	43.53	0	100.0
22	0.548	11569	25.10	54	2.392	8093	82.33	86	10.44	297	99.72	118	45.58	2	100.0
23	0.574	11746	26.95	55	2.505	7741	83.59	87	10.93	280	99.77	119	47.73	2	100.0
24	0.601	11871	28.83	56	2.623	7475	84.79	88	11.45	230	99.81	120	49.98	2	100.0
25	0.629	12214	30.74	57	2.746	7358	85.97	89	11.99	179	99.84	121	52.33	1	100.0
26	0.659	12312	32.68	58	2.876	6750	87.09	90	12.55	136	99.87	122	54.80	1	100.0
27	0.690	12450	34.65	59	3.011	6551	88.14	91	13.14	121	99.89	123	57.38	2	100.0
28	0.722	12711	36.64	60	3.153	6259	89.16	92	13.76	101	99.91	124	60.08	2	100.0
29	0.756	12510	38.64	61	3.302	5886	90.12	93	14.41	72	99.92	125	62.92	0	100.0
30	0.792	12495	40.63	62	3.457	5410	91.02	94	15.09	67	99.93	126	65.88	0	100.0
31	0.829	12465	42.61	63	3.620	5117	91.86	95	15.80	62	99.94	127	68.99	1	100.0
32	0.868	12459	44.58	64	3.791	4743	92.64	96	16.55	35	99.95	128	72.24	1	100.0

IP12_006628

INTERMOUNTAIN POWER MIDDLE DUST

Date: 14 Mar 90 Oper ID: WB Sample Nr: 7774

Low at 1 0.208 0 High at 128 72.24 1 Top of scale is 12800

Graph of Diam Size vs. Differential Counts From channel 1 to 127 skip: 2

Coincidence Corrected: No

% <	Size	0	10	20	30	40	50	60	70	80	90	100
0.000	0.208	>*	.	.	.	.	.	.	.	.	.	.
0.771	0.239	>-	-	-	-	-	*	.	.	.	.	.
3.733	0.275	>--	-	-	-	*	.	.	.	.	.	.
6.973	0.315	>-	-	-	-	-	*	.	.	.	.	.
10.69	0.362	>--	-	-	-	-	*	.	.	.	.	.
14.98	0.416	>-	-	-	-	-	-	*	.	.	.	.
19.78	0.477	>-	-	-	-	-	-	*	.	.	.	.
25.10	0.548	>-	-	-	-	-	-	-	*	.	.	.
30.74	0.629	>--	-	-	-	-	-	-	*	.	.	.
36.64	0.722	>-	-	-	-	-	-	-	-	*	.	.
42.61	0.829	>--	-	-	-	-	-	-	-	*	.	.
48.58	0.952	>-	-	-	-	-	-	-	-	-	*	.
54.39	1.093	>--	-	-	-	-	-	-	-	-	*	.
02	1.255	>-	-	-	-	-	-	-	-	-	*	.
.39	1.441	>--	-	-	-	-	-	-	-	-	*	.
70.47	1.655	>-	-	-	-	-	-	-	*	.	.	.
75.21	1.900	>--	-	-	-	-	-	-	*	.	.	.
79.64	2.181	>-	-	-	-	-	-	*	.	.	.	.
83.59	2.505	>--	-	-	-	-	*	.	.	.	.	.
87.09	2.876	>-	-	-	-	-	-	*	.	.	.	.
90.12	3.302	>--	-	-	-	*	.	.	.	.	.	.
92.64	3.791	>-	-	-	-	*	.	.	.	.	.	.
94.68	4.353	>--	-	-	*	.	.	.	.	.	.	.
96.29	4.997	>-	-	-	*	.	.	.	.	.	.	.
97.52	5.738	>--	*	.	.	.	.	.	.	.	.	.
98.39	6.588	>--	*	.	.	.	.	.	.	.	.	.
99.00	7.564	>--	*	.	.	.	.	.	.	.	.	.
99.41	8.685	>-	*	.	.	.	.	.	.	.	.	.
99.67	9.971	>--	*	.	.	.	.	.	.	.	.	.
99.81	11.45	>*	.	.	.	.	.	.	.	.	.	.
99.89	13.14	>*	.	.	.	.	.	.	.	.	.	.
99.93	15.09	>*	.	.	.	.	.	.	.	.	.	.
99.95	17.33	>*	.	.	.	.	.	.	.	.	.	.
99.97	19.90	>*	.	.	.	.	.	.	.	.	.	.
99.98	22.84	>*	.	.	.	.	.	.	.	.	.	.
99.99	26.23	>*	.	.	.	.	.	.	.	.	.	.
99.99	30.11	>*	.	.	.	.	.	.	.	.	.	.
99.99	34.57	>*	.	.	.	.	.	.	.	.	.	.
100.0	39.70	>*	.	.	.	.	.	.	.	.	.	.
.0	45.58	>*	.	.	.	.	.	.	.	.	.	.
100.0	52.33	>*	.	.	.	.	.	.	.	.	.	.
100.0	60.08	>*	.	.	.	.	.	.	.	.	.	.
100.0	68.99	>*	.	.	.	.	.	.	.	.	.	.
		!	!	!	!	!	!
% <	Size	0	10	20	30	40	50	60	70	80	90	100

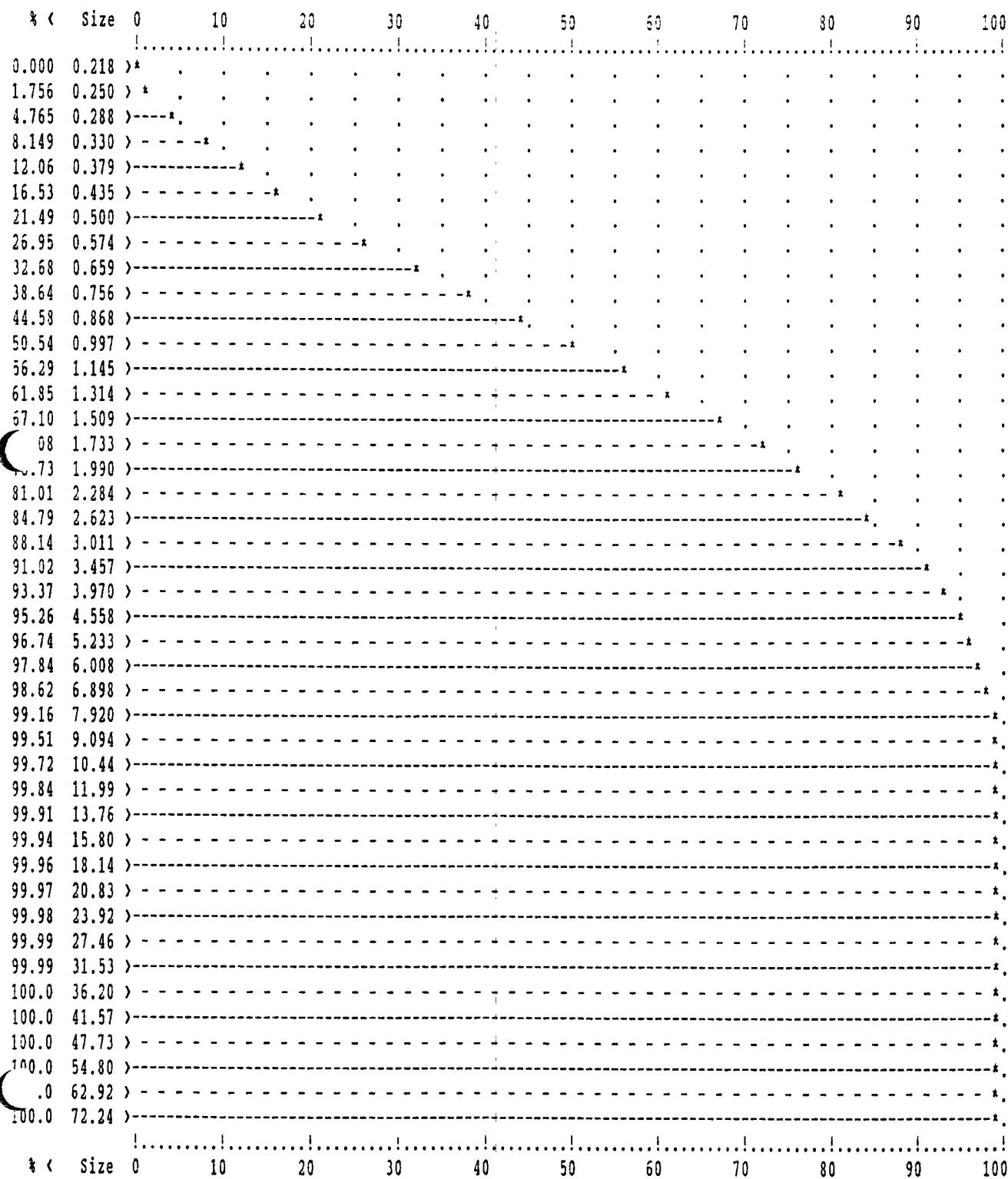
INTERMOUNTAIN POWER MIDDLE DUST

Date: 14 Mar 90 Oper ID: WB Sample Nr: 7774

Low at 2 0.218 0 High at 128 72.24 1

Top of scale is 12300

Graph of Diam Size vs. Cumulative Counts From channel 2 to 128 skip: 2



INTERMOUNTAIN POWER MIDDLE DUST

Date: 14 Mar 90 Oper ID: WB Sample Nr: 7774

Current	Gain	Calib.	Orifice	Flow Pr.	Volume	Timer	Peak	Total
4.5	2.0	0.204 / 1.005773	150.070 um	160.0 mm	100.0 ul	32.0 secs	3200	8000000

geometric mean size = 10.85 arithmetic mean size = 17.61
 standard deviation = 19.21 coeff. of variation = 177.1 skewness = 1.746e-01
 median size = 9.274 mode size = 7.495

Coincidence Corrected: No

Total = 2.313024064e+09

Chnl	Size	Volume	% <	Chnl	Size	Volume	% <	Chnl	Size	Volume	% <	Chnl	Size	Volume	% <
1	0.208	0	0.000	33	0.909	1962692	0.304	65	3.970	31210296	14.62	97	17.33	20717629	69.04
2	0.218	0	0.000	34	0.952	1180024	0.352	66	4.157	32521705	15.99	98	18.14	25108543	70.03
3	0.228	2348	0.000	35	0.997	1357372	0.407	67	4.353	35050663	17.45	99	19.00	22759335	71.06
4	0.239	9328	0.000	36	1.044	1519823	0.469	68	4.558	35614993	18.98	100	19.90	26131238	72.12
5	0.250	10867	0.001	37	1.093	1728802	0.540	69	4.773	39605017	20.61	101	20.83	21001893	73.14
6	0.262	12363	0.001	38	1.145	1994226	0.620	70	4.997	41193228	22.35	102	21.81	20668646	74.04
7	0.275	14368	0.002	39	1.199	2232705	0.712	71	5.233	42176668	24.16	103	22.84	25049182	75.03
,	0.288	17720	0.003	40	1.255	2535049	0.815	72	5.480	45495435	26.05	104	23.92	18164421	75.96
,	0.301	21010	0.003	41	1.314	2868176	0.931	73	5.738	45842130	28.03	105	25.05	26069456	76.92
10	0.315	24910	0.004	42	1.376	3219564	1.063	74	6.008	45604812	30.00	106	26.23	21949964	77.96
11	0.330	30400	0.006	43	1.441	3610791	1.211	75	6.291	46522021	31.99	107	27.46	27493041	79.03
12	0.346	36604	0.007	44	1.509	4076169	1.377	76	6.588	50220357	34.09	108	28.76	18413654	80.02
13	0.362	44299	0.009	45	1.580	4655627	1.566	77	6.898	49345683	36.24	109	30.11	9060738	80.61
14	0.379	52658	0.011	46	1.655	5171962	1.778	78	7.224	49819345	38.38	110	31.53	24273967	81.33
15	0.397	64016	0.013	47	1.733	5748884	2.014	79	7.564	52174340	40.59	111	33.02	35833203	82.63
16	0.416	75812	0.016	48	1.814	6510750	2.279	80	7.920	48253117	42.76	112	34.57	50284740	84.49
17	0.435	91832	0.020	49	1.900	7472313	2.581	81	8.294	50985021	44.90	113	36.20	26243025	86.15
18	0.456	107186	0.024	50	1.990	8074190	2.917	82	8.685	50641764	47.10	114	37.91	18078630	87.11
19	0.477	125615	0.029	51	2.083	9333423	3.294	83	9.094	45168106	49.17	115	39.70	27676084	88.10
20	0.500	152797	0.035	52	2.181	10028437	3.712	84	9.522	47848702	51.18	116	41.57	7944106	88.86
21	0.523	181474	0.043	53	2.284	11266353	4.173	85	9.971	45397629	53.20	117	43.53	0	89.04
22	0.548	210525	0.051	54	2.392	12249838	4.681	86	10.44	37392945	54.99	118	45.58	20944780	89.49
23	0.574	245414	0.061	55	2.505	13452974	5.237	87	10.93	40475448	56.67	119	47.73	24047848	90.46
24	0.601	284771	0.072	56	2.623	14915328	5.850	88	11.45	38173488	58.37	120	49.98	27610648	91.58
25	0.629	336409	0.086	57	2.746	16857058	6.537	89	11.99	34110447	59.93	121	52.33	15850648	92.52
26	0.659	389348	0.101	58	2.876	17755222	7.285	90	12.55	29755942	61.31	122	54.80	18198996	93.25
27	0.690	452043	0.120	59	3.011	19784740	8.096	91	13.14	30396289	62.61	123	57.38	41790520	94.55
28	0.722	529896	0.141	60	3.153	21703416	8.993	92	13.76	29131105	63.90	124	60.08	47981976	96.49
29	0.756	598781	0.165	61	3.302	23433859	9.969	93	14.41	23843417	65.05	125	62.92	0	97.53
30	0.792	686669	0.193	62	3.457	24729834	11.01	94	15.09	25474824	66.11	126	65.88	0	97.53
31	0.829	786510	0.225	63	3.620	26855900	12.13	95	15.80	27066274	67.25	127	68.99	36311932	98.31
32	0.868	902600	0.261	64	3.791	28581026	13.32	96	16.55	17543054	68.21	128	72.24	41691712	100.0

IP12_006631

INTERMOUNTAIN POWER MIDDLE DUST

Date: 14 Mar 90 Oper ID: WB Sample Nr: 7774

Low at 1 0.208 0 High at 128 72.24 41691712

Top of scale is 52428800

Graph of Diam Size vs. Differential Volume From channel 1 to 127 skip: 2

Coincidence Corrected: No

% <	Size	0	10	20	30	40	50	60	70	80	90	100
0.000	0.208 >*	.	.	.	.	.	.	.	.	.	.	.
0.000	0.239 >*	.	.	.	.	.	.	.	.	.	.	.
0.002	0.275 >*	.	.	.	.	.	.	.	.	.	.	.
0.004	0.315 >*	.	.	.	.	.	.	.	.	.	.	.
0.009	0.362 >*	.	.	.	.	.	.	.	.	.	.	.
0.016	0.416 >*	.	.	.	.	.	.	.	.	.	.	.
0.029	0.477 >*	.	.	.	.	.	.	.	.	.	.	.
0.051	0.548 >*	.	.	.	.	.	.	.	.	.	.	.
0.086	0.629 >*	.	.	.	.	.	.	.	.	.	.	.
0.141	0.722 >*	.	.	.	.	.	.	.	.	.	.	.
0.225	0.829 >-*	.	.	.	.	.	.	.	.	.	.	.
0.352	0.952 >-*	.	.	.	.	.	.	.	.	.	.	.
0.540	1.093 >---*	.	.	.	.	.	.	.	.	.	.	.
15	1.255 >--*	.	.	.	.	.	.	.	.	.	.	.
1.211	1.441 >----*	.	.	.	.	.	.	.	.	.	.	.
1.778	1.655 >----*	.	.	.	.	.	.	.	.	.	.	.
2.581	1.900 >-----*	.	.	.	.	.	.	.	.	.	.	.
3.712	2.181 >-----*	.	.	.	.	.	.	.	.	.	.	.
5.237	2.505 >-----*	.	.	.	.	.	.	.	.	.	.	.
7.285	2.876 >-----*	.	.	.	.	.	.	.	.	.	.	.
9.969	3.302 >-----*	.	.	.	.	.	.	.	.	.	.	.
13.32	3.791 >-----*	.	.	.	.	.	.	.	.	.	.	.
17.45	4.353 >-----*	.	.	.	.	.	.	.	.	.	.	.
22.35	4.997 >-----*	.	.	.	.	.	.	.	.	.	.	.
28.03	5.738 >-----*	.	.	.	.	.	.	.	.	.	.	.
34.09	6.588 >-----*	.	.	.	.	.	.	.	.	.	.	.
40.59	7.564 >-----*	.	.	.	.	.	.	.	.	.	.	.
47.10	8.685 >-----*	.	.	.	.	.	.	.	.	.	.	.
53.20	9.971 >-----*	.	.	.	.	.	.	.	.	.	.	.
58.37	11.45 >-----*	.	.	.	.	.	.	.	.	.	.	.
62.61	13.14 >-----*	.	.	.	.	.	.	.	.	.	.	.
66.11	15.09 >-----*	.	.	.	.	.	.	.	.	.	.	.
69.04	17.33 >-----*	.	.	.	.	.	.	.	.	.	.	.
72.12	19.90 >-----*	.	.	.	.	.	.	.	.	.	.	.
75.03	22.84 >-----*	.	.	.	.	.	.	.	.	.	.	.
77.96	26.23 >-----*	.	.	.	.	.	.	.	.	.	.	.
80.61	30.11 >-----*	.	.	.	.	.	.	.	.	.	.	.
84.49	34.57 >-----*	.	.	.	.	.	.	.	.	.	.	.
~.10	39.70 >-----*	.	.	.	.	.	.	.	.	.	.	.
.49	45.58 >-----*	.	.	.	.	.	.	.	.	.	.	.
92.52	52.33 >-----*	.	.	.	.	.	.	.	.	.	.	.
96.49	60.08 >-----*	.	.	.	.	.	.	.	.	.	.	.
98.31	68.99 >-----*	.	.	.	.	.	.	.	.	.	.	.
		!!!!!!!!!!!
% <	Size	0	10	20	30	40	50	60	70	80	90	100

INTERMOUNTAIN POWER MIDDLE DUST

Date: 14 Mar 90 Oper ID: WB Sample Nr: 7774

Low at 2 0.218 0 High at 128 72.24 41691712

Top of scale is 52428800

Graph of Diam Size vs. Cummulative Volume From channel 2 to 128 skip: 2

% <	Size	0	10	20	30	40	50	60	70	80	90	100
0.000	0.218 >*	.	.	.	.	.	.	.	.	.	.	.
0.001	0.250 >*	.	.	.	.	.	.	.	.	.	.	.
0.002	0.288 >*	.	.	.	.	.	.	.	.	.	.	.
0.005	0.330 >*	.	.	.	.	.	.	.	.	.	.	.
0.011	0.379 >*	.	.	.	.	.	.	.	.	.	.	.
0.020	0.435 >*	.	.	.	.	.	.	.	.	.	.	.
0.035	0.500 >*	.	.	.	.	.	.	.	.	.	.	.
0.060	0.574 >*	.	.	.	.	.	.	.	.	.	.	.
0.101	0.659 >*	.	.	.	.	.	.	.	.	.	.	.
0.164	0.756 >*	.	.	.	.	.	.	.	.	.	.	.
0.259	0.868 >*	.	.	.	.	.	.	.	.	.	.	.
0.404	0.997 >*	.	.	.	.	.	.	.	.	.	.	.
0.615	1.145 >*	.	.	.	.	.	.	.	.	.	.	.
0.923	1.314 >*	.	.	.	.	.	.	.	.	.	.	.
1.365	1.509 >-*	.	.	.	.	.	.	.	.	.	.	.
36	1.733 > *	.	.	.	.	.	.	.	.	.	.	.
z.891	1.990 >--*	.	.	.	.	.	.	.	.	.	.	.
4.135	2.284 > - -*	.	.	.	.	.	.	.	.	.	.	.
5.798	2.623 >----*	.	.	.	.	.	.	.	.	.	.	.
8.024	3.011 > - - - -*	.	.	.	.	.	.	.	.	.	.	.
10.91	3.457 >-----*	.	.	.	.	.	.	.	.	.	.	.
14.49	3.970 > - - - - -*	.	.	.	.	.	.	.	.	.	.	.
18.81	4.558 >-----*	.	.	.	.	.	.	.	.	.	.	.
23.94	5.233 > - - - - - -*	.	.	.	.	.	.	.	.	.	.	.
29.74	6.008 >-----*	.	.	.	.	.	.	.	.	.	.	.
35.91	6.898 > - - - - - - -*	.	.	.	.	.	.	.	.	.	.	.
42.38	7.920 >-----	.	.	.	.	.	.	.	.	.	.	.
48.73	9.094 > - - - - - - - -*	.	.	.	.	.	.	.	.	.	.	.
54.50	10.44 >-----	.	.	.	.	.	.	.	.	.	.	.
59.40	11.99 > - - - - - - - - -*	.	.	.	.	.	.	.	.	.	.	.
63.33	13.76 >-----	.	.	.	.	.	*	.	.	.	.	.
66.65	15.80 > - - - - - - - - - -*	.	.	.	.	*	.	.	.	.	.	.
69.40	18.14 >-----	.	.	.	.	*	.	.	.	.	.	.
72.49	20.83 > - - - - - - - - - - -*	.	.	.	.	*	.	.	.	.	.	.
75.28	23.92 >-----	.	.	.	.	*	.	.	.	.	.	.
78.32	27.46 > - - - - - - - - - - - -*	.	.	.	.	*	.	.	.	.	.	.
80.61	31.53 >-----	.	.	.	.	*	.	.	.	.	.	.
85.38	36.20 > - - - - - - - - - - - - -*	.	.	.	.	*	.	.	.	.	.	.
88.07	41.57 >-----	.	.	.	.	*	.	.	.	.	.	.
89.65	47.73 > - - - - - - - - - - - - - -*	.	.	.	.	*	.	.	.	.	.	.
92.42	54.80 >-----	.	.	.	.	*	.	.	.	.	.	.
96.66	62.92 > - - - - - - - - - - - - - - -*	.	.	.	.	*	.	.	.	.	.	.
99.11	72.24 >-----	.	.	.	.	*	.	.	.	.	.	.

% <	Size	0	10	20	30	40	50	60	70	80	90	100
-----	------	---	----	----	----	----	----	----	----	----	----	-----